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Fermentation characteristics of maize/sesbania bi-crop silage

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Introduction Maize is one of the main forages for dairy production and is a suitable material for silage making because of high fermentable carbohydrates, high counts of lactic acid bacteria (LAB) and low buffering capacity (BC) (Nishino *et al.* 2003; McDonald *et al.* 1991). Whole crop maize silage is high in energy but low in crude protein (CP). On the other hand, legumes are high in CP but difficult to conserve because of their low water soluble carbohydrates (WSC) and high BC. It might be possible that maize/legume bi-crop silage compensate for their negative points. *Sesbania* is a legume originated in tropical area and might be suitable for inter-crops with maize. Therefore, we investigated the fermentation characteristics of bi-crop silage from maize and *sesbania*.

Materials and methods Maize (*Zea mays*), *sesbania* (*Sesbania cannabina*) and these bi-crops were sown on 27 May 2004 at Aichi Agricultural College. The bi-crops were produced from inter-cropped two lines of maize and one line of *sesbania*. The seeds rates were 36 kg/ha of maize alone, 42 kg/ha of *sesbania* alone, 24 kg/ha of maize and 14 kg/ha of *sesbania* for bi-crops. The forages were harvested with a maize harvester on 10 August and packed into glass bottle silos (900 ml capacity) in triplicates and then maintained at 30°C for 30 days.

Results Table 1 shows dry matter (DM) yield and chemical composition of ensiled forages. Maize had high WSC and LAB counts and moderate CP content. On the other hand, *sesbania* contained low WSC but high CP. Maize/*sesbania* bi-crop contained higher WSC than *sesbania* and higher CP than maize. Fermentation characteristics of the silages are given in Table 2. Maize/*sesbania* bi-crop silage showed similar pH and organic acid concentration to maize alone silage. However, *sesbania* alone showed higher pH and lower lactic acid than maize alone and bi-crop silage ($P < 0.05$).

Table 1. DM yield and chemical composition of forages

	Maize	Maize-Sesbania	Sesbania
DM yield (t/ha)	13.3	11.3	4.4
DM (g/kg)	24.9	21.6	23.5
WSC (g/kg DM)	93.1	62.9	38.8
CP (g/kg DM)	85.1	105.8	157.7
Buffering capacity (meq/kg DM)	218	246	306
Lactic acid bacteria (log cfu/g FM)	6.26	6.22	4.69

Table 2. Fermentation characteristics of silages

	Maize	Maize-Sesbania	Sesbania	s.e.m.
DM (g/kg)	249 b	216 a	235 ab	6.8
pH	3.79 a	3.93 a	5.49 b	0.06
Lactic acid (g/kg DM)	74.4 b	76.3 b	1.6 a	2.4
Acetic acid (g/kg DM)	13.6 a	17.5 a	34.5 b	1.2
Propionic acid (g/kg DM)	n.d.	n.d.	6.0	0.9
Butyric acid (g/kg DM)	n.d.	n.d.	14.5	1.5
NH ₃ -N (g/kg total N)	20.5 a	31.5 a	78.6 b	3.4
DM loss (g/kg DM)	61.9	77.1	66.4	8.5

Conclusion Maize/*Sesbania* bi-crop could be useful as one of the forage production systems. Feed intake and milk production of the bi-crop silage in dairy cattle should be further investigated.

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